What is claimed is:

- A beamsplitter apparatus for use with a high-power radiation beam,
 comprising:
 - a thermally conducting frame with a central aperture; and
 - a window held in the central aperture so as to be able to conduct heat from the window to the frame, wherein the window includes a diamond substrate.
- 10 2. The beamsplitter apparatus of claim 1, wherein the window includes a coating formed on the diamond substrate.
 - 3. The beamsplitter apparatus of claim 1, wherein the coating is adapted to reflect a select portion of the high-power radiation beam.
- The beamsplitter apparatus of claim 1, wherein the frame includes a cooling conduit formed therein, and the apparatus further includes a cooling system operably coupled to the cooling conduit to flow a cooling fluid through the cooling conduit.
 - 5. The beamsplitter apparatus of claim 1, wherein the central aperture and window are elongate.
- 6. The beamsplitter apparatus of claim 1, wherein the high-power radiation beam has first and second polarization components, and wherein the window includes a coating adapted to reflect the first polarization component and transmit the second polarization component.
- 7. The beamsplitter apparatus of claim 1, wherein the frame includes:
 a retaining groove that runs around the central aperture;
 an O-ring retained in the retaining grove; and
 wherein the window includes a periphery, and wherein the retaining groove and
 O-ring operate to press the window to the frame at or near the window periphery.
- 35 8. The beamsplitter apparatus of claim 1, wherein the frame is made of

copper.

5

- 9. The beamsplitter apparatus of claim 8, wherein the copper frame is coated with a layer of gold.
- 10. The beamsplitter apparatus of claim 1, wherein the frame comprises first and second frame sections.
- 11. The beamsplitter apparatus of claim 1, wherein the frame is attached to a 10 base plate.
 - 12. A beamsplitter apparatus, comprising:
 - a thermally conducting frame having a central aperture;
 - a window flat surface and a periphery, and comprising a diamond substrate;
 - a coating formed on the flat surface; and

wherein the window is held in the frame central aperture at or near the window periphery such that heat absorbed by the window from a high-power radiation beam incident thereon is conducted to the frame to prevent the flat window surface from substantially distorting.

20

30

35

- 13. The beamsplitter apparatus of claim 12, wherein the coating includes one or more films made of a material selected from the group materials comprising: ThF_4 , Ge, ZnSe, and BaF_2 .
- 25 14. The beamsplitter apparatus of claim 12, wherein the frame includes a cooling conduit adapted to flow a cooling fluid therethrough to cool the frame.
 - 15. A method of separating first and second polarization components from a high-power polarized radiation beam, comprising:
 - directing the high-power radiation beam to a first polarizing beamsplitter comprising a thermally conducting frame and a first window held in thermal contact within the frame, the first window including a first coating formed on a diamond substrate;
 - reflecting the first polarization component from the first window to form a first polarized radiation beam, and transmitting the second polarization component through

the first window to form a second radiation beam, while the first window absorbs a portion of high-power radiation beam as heat; and

removing the heat from the first window by transmitting the heat to the frame and cooling the frame so that the first window remains substantially undistorted.

5

16. The method of claim 15, further including directing one of the first and second polarized radiation beams to a second polarizing beamsplitter to enhance the polarization of said one polarized radiation beam.

10

17. A method. comprising:

directing an incident radiation beam to a window held in thermal contact within a frame, the window including a diamond substrate;

reflecting a portion of the incident radiation beam from the window to form a first radiation beam;

15

transmitting a portion of the incident radiation beam through the window to form a second radiation beam, while the first window absorbs a portion of the incident radiation beam as heat; and

removing the heat from the window by transmitting the heat to the frame and cooling the frame so that the first window remains substantially undistorted.

20

- 18. The method of claim 17, including providing a coating to the window, wherein the coating acts to provide a select amount of reflection and transmission of the incident radiation beam.
- 25 19. The method of claim 18, wherein the coating is formed as a polarizing coating.
 - 20. An optical system for irradiating workpiece, comprising:
 - a radiation source adapted to emit a high-power radiation beam;

30

- a beamsplitter apparatus arranged to receive the high-power radiation beam and form therefrom a transmitted high-power radiation beam, wherein the beamsplitter apparatus includes:
 - a thermally conducting frame with a central aperture;
 - a window held in the central aperture so as to be in thermal contact with the frame, wherein the window comprises a diamond substrate; and

a lens arranged to receive one of the transmitted radiation beam and reflected radiation beam and direct it to the workpiece.

• •

20

- 21. The system of claim 20, wherein the high-power radiation beam includes first and second polarization components, and wherein the window includes a beamsplitting coating on the diamond substrate so that the reflected radiation beam includes mostly the first polarization component, and the transmitted radiation beam includes mostly the second polarization component.
- 10 22. The system of claim 20, wherein the transmitted radiation is P polarized, and wherein the lens directs the transmitted radiation to the workpiece at an incident angle at or near the Brewster's angle.
- 23. An optical system for irradiating a first substrate with high-power polarized radiation, comprising:
 - a radiation source adapted to emit a high-power radiation beam along an optical axis;
 - a polarizing beamsplitter apparatus arranged downstream of the radiation source along the optical axis and oriented to receive the high-power radiation beam and form therefrom a reflected high-power radiation beam with a select polarization, the polarizing beamsplitter apparatus comprising:
 - a thermally conducting frame with a central aperture;
 - a window held in the central aperture so as to be able to conduct heat from the window to the frame; and
 - wherein the window comprises a diamond substrate and a beamsplitting film formed on the diamond substrate; and
 - a lens arranged to receive the reflected high-power radiation beam and direct it to the first substrate.